

50 Years of Biomedical Engineering

Biomedical engineering is concerned with research at the interface between medicine and technology. 50 years ago the foundation of a successful research history was laid in Graz – with the introduction of a group of electrical engineering electives called “Wahlfachgruppe IV Elektromedizin”.

Birgit Baustädter

The group of electrical engineering electives laid the foundation of the research genre. Only three years after Stefan Schuy, who later became rector of TU Graz, set up the Institute of Electrical Engineering and Biomedical Engineering. The Austrian Society for Biomedical Engineering was established in 1975.

Today the Biomedical Engineering Building located at Stremayrgasse 16 is home to several institutes – when it comes to clustering specialisations at a single site, TU Graz is second to none in Austria.

INSTITUTE OF NEURAL ENGINEERING

Researchers at the Institute of Neural Engineering focus on communication between the human brain and computers. Processing brain signals – as well as measuring them – is one of the institute’s core focuses. Its findings have found their way into various technologies, such as thought-controlled robotic arms and neuroprosthetics. Neurofeedback systems, cognitive neuroscience, and neuron modelling and simulation – in particular of astrocytes – are also on the research agenda.

INSTITUTE OF BIOMEDICAL IMAGING

Research at TU Graz’s Institute of Biomedical Imaging focuses on in-vivo magnetic resonance tomography (MRT). The institute collaborates with domestic and international partners to devise new strategies for magnetic resonance imaging (MRI) and identification of magnetic resonance biomarkers. “We have pushed back the boundaries of conventional imaging considerably using special multi-channel measuring procedures and improved variational reconstruction techniques,” explains former Institute head Rudolf Stollberger.

INSTITUTE OF HEALTH CARE ENGINEERING WITH EUROPEAN TESTING CENTER OF MEDICAL DEVICES

Researchers at the Institute of Health Care Engineering with European Testing Center of Medical Devices are working on the development of new technological approaches for health diagnostics and therapy. The European Testing Center of Medical Devices is an integral part of the institute. The unit performs testing on newly developed products and certifies their com-

pliance with the relevant standards, which in turn ensures that the products meet certain safety and performance levels. “The testing centre is the only university facility of its kind in Europe,” says Institute head Christian Baumgartner.

INSTITUTE OF BIOMECHANICS

“We build on approaches and methods from mechanics and biology in order to gain a better understanding of biomedical processes in the human body, and develop new diagnostic and treatment options,” says head of Institute Gernot A. Holzapfel, outlining the research strategy at the Institute of Biomechanics. Using devices developed in house, researchers analyse tissue samples using tensile, shear and failure tests, recording the resulting microstructural changes with the help of imaging microscopes. Their aim is to more accurately describe and simulate biomedical processes, such as those that occur in human organs as well as in body proteins, and the progression of diseases that affect them.

INSTITUTE OF BIOMEDICAL INFORMATICS

Laila Taher, head of the Institute of Biomedical Informatics, is making use of machine learning and big data analysis techniques to gain insights into the human genome. “Once human DNA had been sequenced for the first time, everybody thought it would lift the lid on the secrets of humanity,” she says. “Of course, that didn’t happen. On the contrary, the sequencing process generated huge amounts of data, a blueprint for our bodies, but it only comes to life through interaction with our genes. At the moment, we still don’t really understand these processes.” ■



BioTechMed-Graz

Three Graz-based universities – TU Graz, the University of Graz and the Medical University of Graz – have joined forces to form BioTechMed-Graz, a collaboration focused on biomedical research.